Drying.

It must not be inferred that the sulphuring process in itself will dry copra, or that meat which has been treated may be bagged or even stored in heaps with impunity. Whilst sulphured coco-nut meat requires no artificial heat, or exposure to the heat of the sun for a long period after treatment, it must have free access of air, in a covered place, free from rainy weather, or extreme damp. It follows therefore, that until drying has been completed it must be spread out on a dry floor or on trays where the air can freely circulate through the pieces.

Cost of Sulphur.

The expense of sulphuring is negligible when the superior quality of the copra obtained is considered. The sulphur need not be of very refined grade; in fact crude sulphur is preferable, as impurities retard the rate of combustion, and so prolong the period of treatment, from a given weight of sulphur.

Sulphur is available in quantity either from Japan or the Philippines, and could be landed in New Guinea for approximately 15s. per cwt.—a sufficient quantity to treat about 25 tons of copra. There are also sulphur deposits in the territory itself, which could be made perhaps to yield crude sulphur at a very low cost.

REFERENCES.

(1) H. C. Brill, H. O. Parker and H. S. Yeates; "Copra and Coco-nut Oil"—*Philippine Journal of Science*, XII. A; 11, 1917, 80.

(2) A. H. Wells and G. A. Perkins; "Use of Sulphur Fumes in Copra Drying"—*Philippine Journal of Science*, XXI., 1, 1922, 49.

PESTS OF COCOA IN THE TERRITORY OF NEW GUINEA.[1]

By John L. Froggatt, B.Sc., Entomologist.

Although cocoa has been planted for a number of years in various parts of the Territory, it is only in the last few years that any appreciable expansion in the planting of this crop has taken place.

To date, this crop has been comparatively free of serious insect pest infestation, some of the trunk, stem and branch borers being the only ones of major economic importance.

Pests of the Trunk, Branch and Stem.

The most serious pest of cocoa recorded to date is the weevil or snout beetle, *Pantorhytes plutus, Oberth.*[2] (*Curculionidae*). Although this species has been collected in most parts of the Territory, it has, so far, only been recorded as a cocoa pest on portions of New Britain.

Owing to the difficulty, in many cases, of attacking the pest with mechanical measures, inquiries are in hand in reference to possible biological control.

Damage occasioned to limbs and branches by larvae of *Cerambycinae* is sufficiently common as to need careful watching. *Dictamia sp. near rugosa Pasc.* has been bred from such infested timber, but it would appear, from reports received, that there is at least one other species concerned.

The introduction of small quantities of *Paradichlorbenzene* into the grub channels will kill the larvae, the alternative being the use of a piece of thin wire inserted as a seeker into the borings to puncture, or so kill, the grubs.

Occasionally *Lepidopterous* larva and the grubs of *Orthorrhinus patruelis,* Pasc. (*Curculionidae*)[2] have been found boring in the branches, neither of which, however, appear to be numerous. The former has also been bred from the stems and main laterals of coffee trees.

Calotermes papua, Desneux (*Isoptera*) at times attacks the trunks of well-grown trees and may cause appreciable damage. This is a very large " white ant ", the workers measuring three quarters of an inch in length and the adult, males and females, an inch and three quarters from the head to the tip of the folded wings. This species has also been found in the stems of old Annatto (*Bixa orellana*) bushes. A solution of paradichlorbenzene in Kerosene (in the proportion of 2 lb. to 4 gallons) poured into the workings has killed the termites without apparently harming the tree.

In Malaya, termites attacking rubber trees are treated by the fumes from arsenic and sulphur burning together being blown through the workings in the trunk. These machines cost £5 to £6 sterling.

Pests of the Foliage.

Several species of the genus *Rhyparida* (*Eumolphidae*) including *Rhyparida obscuripennis,* Jac., attack the young foliage, and where present in any numbers may affect the growth of the young twigs.

These are small brown or black beetles, which have the habit of dropping from the foliage when disturbed.

When the attack occurs on small trees this habit may be used for their collection by hand, by holding a net or tin under the infested foliage and shaking the twig, when the beetles fall into the container and can then be readily destroyed.

Platyachus ruralis, Fst. (*Curculionidae*) is a small grey weevil, which at times also feeds on the young foliage.

There are four species of moths, all belonging to the family *Noctuidae,* which have been bred from caterpillars collected on the foliage, namely *Tiracola plagiata* Wlk., *Prodenia litura,* F. and a species of the genus Erias, while a species of *Limacodidae* (Cup Moths) (as yet unidentified) has been found feeding on cocoa foliage in the Kieta district.

Tiracola plagiata is a reddish brown moth measuring about 2 inches across the outspread wings; the caterpillars are dark in colour and about 2½ inches in length.

Prodenia litura measures approximately 1¾ inches across the outspread wings, and is brown in colour with white tracery markings on the upper wings.

Erias sp. is a small yellow moth.

Two species of "*Froghoppers*" are not uncommon in both nymphal and adult forms on cocoa, but apparently do no damage to the trees; these are *Euricania splendida F* (*Ricaniidae*) and *Euphanta pokiana, Dist., (Flatidae)*. These insects have the habit when disturbed of "jumping" as well as flying.

Euricania splendens is generally dark brown with a green tinge in colour with transparent areas in the wings, and is about ¾ inch in length, over the folded wings. *Euphanta pokiana* is green in colour, the wings folding in rather a "tent shape"; it is also about ¾ inch in length over the folded wings.

Aphids and "*mealy bugs*" are occasionally seen on young tip foliage, but are negligible as a pest.

A small dark-coloured species of *Thysanoptera* ("Thrips"), as yet unidentified, has been collected on the foliage of young cocoa bushes on one plantation on New Britain, but has not caused any material damage; control has been obtained by spraying.

Yellowish-brown patches on the leaves indicate the presence of this insect, which is readily seen with the aid of a lens under the light covering of webbing formed by the thrips; all stages may be present at the one time. The nymphal stages are marked with two red bands across the middle of the body.

Insects Damaging the Pods.

Lepidopterous larvae have been occasionally found tunnelling in the hard casing of the pods, but difficulties have been met with in breeding out the adults; the channellings made by these caterpillars may lead to the introduction of fungous rots. "*Mealy bugs*" are sometimes present on the outside of the pods, but apparently do no material damage.

Two species of *Rutelidea, Parastasis inconstans Frm.*, and *Parastasia marmorata, Gestro.*, have been recorded as eating off the surface tissue of the pods, but are of comparatively rare occurrence. These beetles are about ¾ inch in length and have the wing covers dark reddish brown, and the thorax and head dark biscuit colour.

Control (General).

Beetles and caterpillars feeding on the foliage can be controlled by spraying or dusting with arsenicals, such as arsenate of lead; sap-sucking insects, if present in plague quantities, can be controlled with a quick-breaking type of oil spray, kerosene emulsion or lime-sulphur spray fluid.

Insect Specimens Required.

It would be of material assistance if owners of cocoa plantations would co-operate with the technical officers of the department in forwarding specimens of insects damaging *any* part of the trees; beetles and other hard-bodied insects could be forwarded in spirit; caterpillars could be placed in a ventilated box, with sufficient feeding material to enable them to live through the period of transport.

(1) We are indebted to the Imperial Bureau of Entomology for insect identifications.

(2) *Vide New Guinea Agricultural Gazette*, Volume 4, No. 1, 1938, *Weevil Pests of Cocoa.*